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**Department of Environmental Sciences**

**College of ……Science**

**University of ……Salahaddin…………………….**

**Subject: Practical Environmental microbiology**

**Course Book – (2 year**

**Lecturer's name :MSc. Rezan Sabah Ahmed**

**Academic Year: 2022/2023**

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| **1. Course name** | **Practical Environmental microbiology** |
| **2. Lecturer in charge** | **Shean Ismael Saleh** |
| **3. Department/ College** | **Environmental Sciences/science**  |
| **4. Contact** | **e-mail:shen.saleh @su.edu.krd****Tel: (optional)** |
| **5. Time (in hours) per week**  | **3**  |
| **6. Office hours** | **10 h** |
| **7. Course code** |  |
| **8. Teacher's academic profile**  | I am Rezan Sabah I have MSc. in environmental microbiology I get it during 2017 at environment Department in College of Science-salahaddin University. I am an active lecturer in environment department  |
| **9. Keywords** |  |
| **10. Course overview:**In this subject the students will learn practically the presence of microorganisms in the environment by culturing samples from different source (soil ,water and air )then identify these microorganisms . each student will be able how to culture the bacteria by different methods and how to count bacteria in any sample then identify the bacteria by cultural characteristic and staining then differentiating the species by biochemical test to know the useful one and harmful one or pathogenic bacteria .also the students will take information about sterilization methods and instruments also how to work by espetic technique in the lab. In addition to getting practical information about media and method of culturing and identification of fungi in the environment . also isolation of microorganisms in air by different method in different places .  |
| **11. Course objective:**The course will cover general concepts in environmental microbiology. The microbial world comprises microscopic algae, fungi, bacteria, viruses and protozoa. The course attempts to understand and enhance students to acquire a basic knowledge about microbiology and the microbial problems to the environment, also to understand the relationships between humans and the microorganisms as they are the oldest, the most numerous and diversified form of life on earth. Also to introduce students with the importance of microorganisms in the environment, the methodologies used for the detection of their activities.This subject prepared to teach second stage students through one year (two courses) study. Instructional and laboratory work to make students familiar with understanding of fundamental principles of microbiology and its applications in the laboratory, also an approach to understand possible solutions, and another important topic.  |
| **12. Student's obligation**The students obligate to work in lab and follow up the result of each lab by examination also practical examination and taking homework. |
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| **14. Assessment scheme**1.working in the lab. 2.follow up the result.3.Weekly quiz 4.practiclly examination  |
| 15. Student learning outcome:At the end of this course each student should be able to culture and identify the microorganisms the different environmental samples (soil, water and air).Detect bacteriophage the sewage water. Identify common protozoa in the environment .These information are very useful for each one want to work in any field or institute of environmental science. after getting of these information the student can work in field of remediation (using of microorganisms in cleaning of environment .  |
| **16. Course Reading List and References‌:**1. Experiments in Microbiology, Plant Pathology and Biotechnology. Aneja K.R. (2003).
2. Guideline for Drinking Water Quality. WHO: World Health Organization, (2004).
3. Guideline for Drinking Water Quality. WHO: World Health Organization, (1997).
4. Introductory Microbiology. Ross, F.C., (1983).
5. Laboratory Exercises in Microbiology. Harley, J.P. and Prescott, L.M. (1996).
6. Manual of Experimental Microbiology. Atlas R.M.; Brown, A.E. and Parks, Microbiological Applications. Brown, A.E. (2005).
7. Microbiology Experiments. Kleyn, J. and Bicknell, M. (2004).
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| **17. The Topics:** | **Lecturer's name** |
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| Preface. |
| **Principles of Microbiology**( 1 week) |
| Introduction to microbiology(1 week) |
| The instruments in microbiology lab(1 week) |
| Sterilization and disinfection(1 week) |
| Microbial culture media(1 week) |
| Cultivation of bacteria (2 week) |
| Colony morphology (1 week)  |
| Bacterial staining (1 week) |
| Biochemical test (2week) |
| **Aquatic Microbiology:** |
| Methods of sampling and preparation technique for laboratory analysis(1week) |
| Detection of water borne pathogens bacteria (5 week) |
| General concepts of epidemiology and public health concerns, studying water- borne pathogens(1 week) |
| Microbial quality indicators (bacteria, algae, protozoa)(1 week) |
| Exam  |
| Microbiology of bath water(1week) |
| A field to a water treatment plant. |
| Exam. |
| **Soil microbiology:** |
| Introduction to soil microbiologyShort- term definition of soil ,microorganisms (bacteria, actinomycetes, fungi, algae, protozoa) (1 week) |
| Detection of microbial biomass(1week) |
| Studying of soil fungi and actinmycetes (2week) |
| **Air Microbiology:** |
| Introduction, distribution, transport of air-borne microorganisms and detection of aerosol-deposited microorganisms.(2week) |
| Isolation of air-borne pathogens(.1week) |
| Exam. |

 | Shean Ismael  |
| **19. Examinations:****Q1/A-**For what purpose this equipment is used in microbiology lab?1.autoclave:- used for sterilizing of heat resistant materials like media, liquids, papers, glassware, heat resistant plastics, cotton, gauzes, bandages, soil at 121°C ,15 pound.  2. Bunsen burner:- **:** 800-1800°C for few seconds. Sterilize loops and needles, test tube mouth. Also it is a common method used in hospitals for burning of syringes, beddings and pathological samples. **Q1/B-**The following articles can be sterilized by1.Cottonautoclave:- 2. Test tube oven 3. Mouth of test tube Bunsen burner 4.forceps Bunsen burner**Q2/A**- What is the difference between tube 1 and tube 2**Tube1 contain bacteria (culture) tube 2 just media** **Q2/B-** Write the type of the following media 1.blood agar enrich media 2. MacConkey agar selective media 3.mannitol salt agar selective media 4.EMB selective media **Q3/A-** by which method the bacteria in this plate is cultured Streack method **Q3/B-** What are the diseases that Staphylococci caused ? they may become a causative agent of various human infections including skin, ear, upper respiratory tract, intestinal tract and urinary tract. **Q4/A-**Describe this colony 1. Form…round…. 2. Surface…rough…….. 3. Margin……irregular ………4.elevation …flat……………**Q4/B-**By which method we can exam the following sample for presence of microorganism1. Surgical theatres **Settle plate method**
2. Linen **Sweep plate method**
3. Furniture **Dust sampling method**
4. One cubic foot of air **Slit sampling method**

**Q5/A**-Enumitare methods of soil microbiology examination ?**1.Rossi and Cholodny method****2.Most probable number (MPN):****3. Standard plate count**: **Q5/B**-write name of this equipment and in what test is used ?filter holder base and filtration apparatusmembrane filter **Q6/A-** Write name and result of this test?**Mpn 010****Q6/B-** define stains and enumerate its types with short explanation?**Stains (dyes):-** are chemicals containing chromophores( groups that impart color).There are 2 types of stains* Basic stain (crystal violet, safranin )is a stain that is cationic (positively charged) will bind electrostatically to negatively charged molecules such as many polysaccharides, proteins and nucleic acids(stain the bacteria )

 Acid dyes (Nigrosine and congo red) have negatively charged chromophores and are repelled by the bacterial surface forming a deposit around the organism. They stain the background and leave the microbe transparent**Q7/A**-Write name and reagent of this test slide catalase test resultsCatalase test ,h2o2**Q7/B-** Write name and reagent of this testSugar fermentation ,phenol red  mhtml:file://C:\Users\SAIF\Desktop\New%20folder\Biochemical%20Tests%2011.mht!http://www.mesacc.edu/~johnson/labtools/Dbiochem/s_cho.gif**Q8/A**-Write name ofmadia and positive result that used in isolation of the following bacteria?1.*Salmonella*Ss agar production of gas and black precipitation due to H2S*2.E.coli EMB**Positive result: production of small colonies with green metallic sheen after 24-48h*Q8/B- Briefly explain**Colony Morphology of fungi ?**1.Colony Morphology (macroscopic features) 1. Surface topography - Some fungal colonies may be free growing, covering the entire surface of agar in a particular manner; others grow in a restricted manner. 2. Surface texture : cottony , granular, chalky, velvety, powdery, silky, glabrous (smooth, creamy), waxy, etc. 3. Pigmentation - Fungi may be colorless or brightly colored. Color may be on fungus itself, on its sporulating apparatus, on the agar, or on the bottom of the colony (reverse pigmentation). Pigment color is due to the color of the sporulating apparatus. The pigment can be diffused into the agar**.** **Q9/A-** Write the method of staining in this figure then write the name of stains that used ?C:\Users\SAIF\Desktop\Gram_stain_01.jpgGram stain ,crystal violet,safranin**Q9/B-** Write the phylum and name of this organism C:\Users\SAIF\Desktop\paramecium3.jpgPhylum: Ciliophora. Example: *Paramecium sp***Q10/A-**Write the phylum , name and important character of this organism**Phylum: Annelida** Their body divided into rings, they have straight digestive system starting by prostomia and ending with annus. Example: *Lumbricus sp.* (earth worm) . C:\Users\SAIF\Desktop\Staphylinus_olens_vs_lumbricus_terrestris.jpg**Q10/B-** Write the name of this test ,then enumerate the organism that grown on this plate?**Detection of bacteriophages,bacteriophage ,e.coli**C:\Users\SAIF\Desktop\Phages_Fig03.jpg**Q1/Fill the following blank****1.**culture media sterilize by …………….. and human skin sterilized by …….. **2.**we use pipette to transfer ………. and used for…….**3.**solid media are used for ………. and ………**4.**culture media is …………………… and culture is ………..5. bacterial smear is fixed by heat to …………and…………..**Q2/A-** how can you describe bacterial colony (edge) with draw?**Q2/B**-talk about isolation of fungi from endo infected plant tissue? **Q2/C-** Compare between pour plate method and spread method ? |

**Course Book**